Black Box Corporation
The World's Source for Cabling and Network Connectivity℠

US Power Supply	International Power Supply
MT660A-MM	MT660A-MM-E
MT661A-SM	MT661A-SM-E
MT662A-MSC	MT662AE-MSC
MT663A-SSC	MT663AE-SSC
MT664A-SSC	MT664AE-SSC

FlexPoint™ T1/E1 Copper to Fiber Line Driver

CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)

FREE technical support 24 hours a day, 7 days a week; Call **724-746-5500** or fax **724-746-0746**

Mailing address: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018

Web site: **www.blackbox.com**

E-mail: **info@blackbox.com**

Description:

The FlexPoint T1/E1 connects T1 and E1 devices, such as PBXs, CSUs and routers, via multimode (MM) or single-mode (SM) fiber. Designed to extend the standard T1/E1 twisted pair or Coax network distances over fiber, this converter provides protection from environmental noise and effectively increases high-speed network reliability. The following models are described here.

Model #	Fiber Type	Max Distance
MT660A-MM	MM, ST, 1300nm	5km / 3.1mi
MT661A-SM	SM, ST, 1300nm	28km / 16.8mi
MT662A-MSC	MM, SC, 1300nm	5km / 3.1mi
MT663A-SSC	SM, SC, 1300nm	28km / 16.8mi
MT664A-SSC	SM, SC, 1300nm	58km / 36 mi
MT660A-MM-E	MM, ST, 1300nm	5km / 3.1mi
MT661A-SM-E	SM, ST, 1300nm	28km / 16.8mi
MT662AE-MSC	MM, SC, 1300nm	5km / 3.1mi
MT663AE-SSC	SM, SC, 1300nm	28km / 16.8mi
MT664AE-SSC	SM, SC, 1300nm	58km / 36 mi

Power Adapter Notice

1. When Using in a stand-alone configuration, this product is intended to be and must be used only with a Listed Direct Plug-In Power Unit marked "Class 2" and rated at 9VDC, 1 Amp.
2. This product should always be used only with the supplied power unit .
3. Models shipped with international power supplies are capable of auto switching from 100-230V, and are supplied with a U.S. type NEMA 5-15 power cable.
4. For products being shipped outside of the U.S., the user is required to install a properly grounded IEC

320 appliance cable with a minimum rating of 10 AMPs.

5. User-supplied cables must meet the required safety agency approvals, applicable international standards and electrical ratings for the region.

WARNING!

Before inserting the Power Adapter, verify that the power on the unit is appropriate for your AC line voltage source.

Mounting instructions:

The FlexPoint Fiber Converter can be solo-mounted using a wall-mounting kit, or rack-mounted using a 5-unit shelf, or a high-density FlexPoint 14-Unit Power-Redundant Chassis.

Fiber Optic Cable Attachment:

Connect the fiber cables between the FlexPoint T1/E1 converters. The transmit (Tx) must attach to the receive side and the receive (Rx) must attach to the transmit side.

Note: Use fiber cables that are compliant with the specifications that are outlined in fiber cable specifications.

Copper Cable Attachment:

RJ-45/RJ-48 T1/E1 connector

Connect to the RJ-45/48 connector on the FlexPoint T1/E1 converter via a category 3 or better cable (Category 5 is recomended) and attach the other end to the network equipment. (The twisted pair connection requires two active pairs in a T1/E1 environment. The active pairs are pins 1&2 and pins 4&5. Only dedicated wire pairs should be used for the active pins.) Set the UTP DCE / DTE switch for the RJ-45/48 port to the appropriate setting.

Note: Use copper cables that are compliant with the specifications that are outlined in copper cable specifications.

Coax E1 Connector

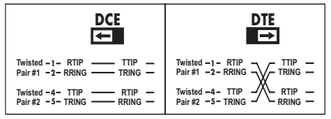
Attach the BNC to the FlexPoint T1/E1 converter and attach the other end of the BNC to the network equipment.

Note: Use copper cables that are compliant with the specifications that are outlined in copper cable specifications.

Switch Settings:

UTP DCE/DTE setting

The UTP DCE/DTE switch is used to eliminate the need for crossover and custom cables to connect devices together when using the RJ-45/48 port. Set this switch to DCE to use a straight-through cable and to DTE when a crossover-cable would be required.



T1/E1 Copper line configuration settings

The T1/E1 copper line codes and line lengths are configured using dip switches located on the side of the FlexPoint T1/E1 media converter.

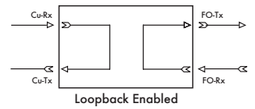
Line Type	Port Type	Distances	Switch Positions 1	2	3	4
T1 DSX-1	RJ-45/48	0' - 133'	B	B	B	B
T1 DSX-1	RJ-45/48	133' - 266'	B	B	B	A
T1 DSX-1	RJ-45/48	266' - 399'	B	B	A	B
T1 DSX-1	RJ-45/48	399' - 533'	B	B	A	A
T1 DSX-1	RJ-45/48	533' - 655'	B	A	B	B
T1 DS-1	RJ-45/48	0 dB	B	B	B	B
T1 DS-1	RJ-45/48	-7.5 dB	B	A	B	A
T1 DS-1	RJ-45/48	-15.0 dB	B	A	A	B
T1 DS-1	RJ-45/48	-22.5 dB	B	A	A	A
E1 75 Ω	Coax/BNC	Standard	A	B	B	B
E1 120 Ω	RJ-45/48	Standard	A	B	B	A
E1 75 Ω	Coax/BNC	Extended	A	B	A	B
E1 120 Ω	RJ-45/48	Extended	A	B	A	A

Operational switch settings and functions

The following operational switches located on the front of the FlexPoint T1/E1 converter are to assist in installation and fault isolation.

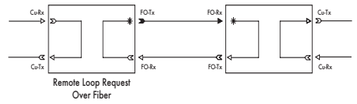
Local loop-back (L/LB)

This switch will set the FlexPoint T1/E1 converter in a loop-back mode on both the fiber and copper connections. By returning the switch to the normal position the unit will resume to normal operation.



Remote loop-back (R+L/LB)

This switch will allow the entire fiber segment to be tested at either of the FlexPoint T1/E1 converters without having to set switches on both units. When set in this mode of operation the local unit is switched in a local loop-back mode. And in addition to the local loop-back mode of operation the fiber Tx port will be further encoded to carry a remote loop-back protocol. This remote loop-back protocol will set the far end FlexPoint T1/E1 converter to remote loop-back mode of operation and return a signal to the sending unit. An LED on the local and remote FlexPoint T1/E1 converters will show a confirmation that the fiber segment is communicating properly between devices. By returning the switch to the normal position it will resume to normal operation.



Local loop-back and Remote loop-back

When both Local and Remote Loop-back are set to the Normal position, the FlexPoint T1/E1 uses the default B8ZS data format. When both switches are turned to their On position, it uses the AMI data format.

Transmit/force 1's to fiber

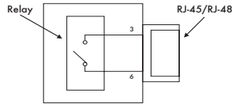
This switch is used to insert an "all ones" pattern into the data stream being transmitted out of the fiber port on the FlexPoint T1/E1 converter. Data being received on the coax or twisted pair will be disabled and data being received on the fiber is passed through to the coax or twisted pair side. By returning the switch to the normal position the unit will resume to normal operation.

Transmit/force 1's to Coax or UTP

This switch is used to insert an "all ones" pattern into the data stream being transmitted out of the coax or twisted pair on the FlexPoint T1/E1 converter. Data being received on the fiber will be disabled and data being received on the coax or twisted pair is passed through to the fiber side. By returning the switch to the normal position the unit will resume to normal operation.

Alarm Relay Contacts

The FlexPoint T1/E1 converter also features dry relay contacts for optionally connecting the media converter into a separate T1/E1 alarm circuit. The relay closes when a loss of power or when signal detect is lost to the copper or fiber connection.



Operational rating on relay pins 3 & 6: 0-220VDC max 2A

LED Indicators

LED	Color	Status	Description
Power:			
	Yellow	On	Power applied
Fiber:			
	Green	Off	No signal detect
		On	Signal detect
		Blink	All ones received
UTP/Coax:			
	Green	Off	No signal detect
		On	Signal detect
		Blink	All ones received
Test:			
	Yellow	Off	Normal operation
		On	L/LB or All 1's Test mode
		Blink	R+L/LB Received master
		Fast Blink	R+L/LB Received slave

Fiber Cable Specifications:

Multimode

Cable:	50/125, 62.5/125, 100/140 μm
Wavelength:	1300nm
Max Distance:	5km / 3.1mi

Single-mode

Cable:	9/125 μm
Wavelength:	1300nm
Max Distance:	28km / 16.8mi

Single-mode long-haul

Cable:	9/125 μm

Wavelength:	1300nm
Max Distance:	58km / 36mi

Copper Cable Specifications:

Twisted-Pair cable for T1

Gauge	22 to 24 AWG
Impedance	100 Ω ± 10%
Impedance characteristic	2.6 dB / 100m @ 1.0 MHz
Maximum distance	6,000 ft

Twisted-Pair cable for E1

Gauge	22 to 24 AWG
Impedance	120 Ω ± 10%
Impedance characteristic	2.6 dB / 100m @ 1.0 MHz
Maximum distance	8,000 ft

Coax cable for E1

Gauge	22 to 24 AWG
Impedance	75 Ω ± 10%
Impedance characteristic	2 dB / 100m @ 1.0 MHz
Maximum distance	8,000 ft

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TRADEMARKS

FEDERAL COMMUNICATIONS COMMISSION AND CANADIAN DEPARTMENT OF COMMUNICATIONS RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to be cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numéirques de las classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

NORMAS OFICIALES MEXICANAS (NOM)

ELECTRICAL SAFETY STATEMENT

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedelstales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra or superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u ostros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precación debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
    A: El cable de poder o el contacto ha sido dañado; u
    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
    C: El aparato ha sido expuesto a la lluvia; o
    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    E: El aparto ha sido tirado o su cubierta ha sido dañada.

040-01021-001E 3/06

Local loop-back and Remote loop-back

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Transmit/force 1's to fiber

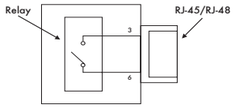
This switch is used to insert an "all ones" pattern into the data stream being transmitted out of the fiber port on the FlexPoint T1/E1 converter. Data being received on the coax or twisted pair will be disabled and data being received on the fiber is passed through to the coax or twisted pair side. By returning the switch to the normal position the unit will resume to normal operation.

Transmit/force 1's to Coax or UTP

This switch is used to insert an "all ones" pattern into the data stream being transmitted out of the coax or twisted pair on the FlexPoint T1/E1 converter. Data being received on the fiber will be disabled and data being received on the coax or twisted pair is passed through to the fiber side. By returning the switch to the normal position the unit will resume to normal operation.

Alarm Relay Contacts

The FlexPoint T1/E1 converter also features dry relay contacts for optionally connecting the media converter into a separate T1/E1 alarm circuit. The relay closes when a loss of power or when signal detect is lost to the copper or fiber connection.



Operational rating on relay pins 3 & 6: 0-220VDC max 2A

LED Indicators

LED	Color	Status	Description
Power:			
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Fiber:			
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UTP/Coax:			
	Green	Off	No signal detect
		On	Signal detect
		Blink	All ones received
Test:			
	Yellow	Off	Normal operation
		On	L/LB or All 1's Test mode
		Blink	R+L/LB Received master
		Fast Blink	R+L/LB Received slave

Fiber Cable Specifications:

Multimode

Cable:	50/125, 62.5/125, 100/140 μm
Wavelength:	1300nm
Max Distance:	5km / 3.1mi

Single-mode

Cable:	9/125 μm
Wavelength:	1300nm
Max Distance:	28km / 16.8mi

Single-mode long-haul

Cable:	9/125 μm

Wavelength:	1300nm
Max Distance:	58km / 36mi

Copper Cable Specifications:

Twisted-Pair cable for T1

Gauge	22 to 24 AWG
Impedance	100 Ω ± 10%
Impedance characteristic	2.6 dB / 100m @ 1.0 MHz
Maximum distance	6,000 ft

Twisted-Pair cable for E1

Gauge	22 to 24 AWG
Impedance	120 Ω ± 10%
Impedance characteristic	2.6 dB / 100m @ 1.0 MHz
Maximum distance	8,000 ft

Coax cable for E1

Gauge	22 to 24 AWG
Impedance	75 Ω ± 10%
Impedance characteristic	2 dB / 100m @ 1.0 MHz
Maximum distance	8,000 ft

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320 appliance cable with a minimum rating of 10 AMPs.

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Before inserting the Power Adapter, verify that the power on the unit is appropriate for your AC line voltage source.

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The FlexPoint Fiber Converter can be solo-mounted using a wall-mounting kit, or rack-mounted using a 5-unit shelf, or a high-density FlexPoint 14-Unit Power-Redundant Chassis.

Fiber Optic Cable Attachment:

Connect the fiber cables between the FlexPoint T1/E1 converters. The transmit (Tx) must attach to the receive side and the receive (Rx) must attach to the transmit side.

Note: Use fiber cables that are compliant with the specifications that are outlined in fiber cable specifications.

Copper Cable Attachment:

RJ-45/RJ-48 T1/E1 connector

Connect to the RJ-45/48 connector on the FlexPoint T1/E1 converter via a category 3 or better cable (Category 5 is recomended) and attach the other end to the network equipment. (The twisted pair connection requires two active pairs in a T1/E1 environment. The active pairs are pins 1&2 and pins 4&5. Only dedicated wire pairs should be used for the active pins.) Set the UTP DCE / DTE switch for the RJ-45/48 port to the appropriate setting.

Note: Use copper cables that are compliant with the specifications that are outlined in copper cable specifications.

Coax E1 Connector

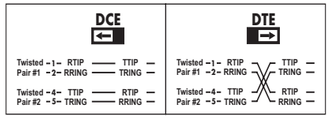
Attach the BNC to the FlexPoint T1/E1 converter and attach the other end of the BNC to the network equipment.

Note: Use copper cables that are compliant with the specifications that are outlined in copper cable specifications.

Switch Settings:

UTP DCE/DTE setting

The UTP DCE/DTE switch is used to eliminate the need for crossover and custom cables to connect devices together when using the RJ-45/48 port. Set this switch to DCE to use a straight-through cable and to DTE when a crossover-cable would be required.



T1/E1 Copper line configuration settings

The T1/E1 copper line codes and line lengths are configured using dip switches located on the side of the FlexPoint T1/E1 media converter.

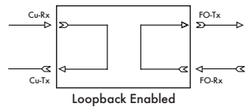
Line Type	Port Type	Distances	Switch Positions 1	2	3	4
T1 DSX-1	RJ-45/48	0' - 133'	B	B	B	B
T1 DSX-1	RJ-45/48	133' - 266'	B	B	B	A
T1 DSX-1	RJ-45/48	266' - 399'	B	B	A	B
T1 DSX-1	RJ-45/48	399' - 533'	B	B	A	A
T1 DSX-1	RJ-45/48	533' - 655'	B	A	B	B
T1 DS-1	RJ-45/48	0 dB	B	B	B	B
T1 DS-1	RJ-45/48	-7.5 dB	B	A	B	A
T1 DS-1	RJ-45/48	-15.0 dB	B	A	A	B
T1 DS-1	RJ-45/48	-22.5 dB	B	A	A	A
E1 75 Ω	Coax/BNC	Standard	A	B	B	B
E1 120 Ω	RJ-45/48	Standard	A	B	B	A
E1 75 Ω	Coax/BNC	Extended	A	B	A	B
E1 120 Ω	RJ-45/48	Extended	A	B	A	A

Operational switch settings and functions

The following operational switches located on the front of the FlexPoint T1/E1 converter are to assist in installation and fault isolation.

Local loop-back (L/LB)

This switch will set the FlexPoint T1/E1 converter in a loop-back mode on both the fiber and copper connections. By returning the switch to the normal position the unit will resume to normal operation.



Remote loop-back (R+L/LB)

This switch will allow the entire fiber segment to be tested at either of the FlexPoint T1/E1 converters without having to set switches on both units. When set in this mode of operation the local unit is switched in a local loop-back mode. And in addition to the local loop-back mode of operation the fiber Tx port will be further encoded to carry a remote loop-back protocol. This remote loop-back protocol will set the far end FlexPoint T1/E1 converter to remote loop-back mode of operation and return a signal to the sending unit. An LED on the local and remote FlexPoint T1/E1 converters will show a confirmation that the fiber segment is communicating properly between devices. By returning the switch to the normal position it will resume to normal operation.